PROCEDURES FOR RESIDENTIAL MECHANICAL VENTILATION

Better construction practices result in tighter homes with significantly reduced air infiltration. Unlike commercial buildings, residential fresh air ventilation is rarely automated and is primarily the responsibility of the occupants. Natural ventilation through windows and other controllable openings is the primary source of outside air in most new homes which are relatively air tight and, if the windows are operated properly they can provide perfectly adequate ventilation. To ensure proper operation by the occupants, it is important that they be educated about the importance of fresh air ventilation and about proper operation of the natural ventilation system.

Concern about occupants not properly operating windows, which can have health and safety ramifications, has led some builders to consider mechanical ventilation. The simplest installation is constant, whole-house ventilation that uses a small, central fan to induce ventilation through an opening in the house.

The benefits of whole-house ventilation should be weighed against the costs, both the first costs of the equipment and the energy costs to the homeowner to run the fan. To reduce litigation exposure from indoor air pollution and humidity/condensation problems, some builders have opted to install mechanical ventilation devices, such as a whole-house ventilation system.

These procedures are intended to be a guide for those builders who have decided to install whole house ventilation systems. The underlying principle behind this system is that the introduction of outside air into the conditioned space be *intentional* and *controllable* rather than accidental or incidental.

CONTROLS

Ventilation of the conditioned space shall be readily controllable either by closing (e.g., dampers or windows) or by switchable mechanical fans used exclusively for ventilation. All such fans shall have automatic or gravity actuated back-draft dampers to prevent infiltration while not in use.

Mechanical ventilation systems shall be controlled by a simple on-off switch. This switch shall be readily accessible, clearly visible and be permanently labeled as the control for the ventilation system.

SIZING

Central mechanical ventilation systems shall be sized according to Table 1, below.

Square footage of house	Total ventilation (CFM[1])	Min Duct diameter[2]
up to 1300	60	4”
1300 to 2000	90	5”
2000 to 2600	120	6”
2600 to 3200	150	6”
3200 to 3800	180	7”
3800 to 4500	210	7”
4500 to 5100	240	8”
over 5100	30 cfm per 650 sqft	calculate

[1]CFM = cubic feet per minute: Alternative 1: Fan rating from manufacturer’s specifications with duct sized according to manufacturer’s specifications. Fan airflow (in CFM) shall be calculated to account for pressure loss due to ducting and fittings. System capacity shall be based on actual installation rather than a simple rating based on air flow at atmospheric or other simplified conditions. Refer to manufacturer’s data for maximum duct lengths.
Alternative 2: Fan rating value at 0.25”wg.
[2]Minimum main trunk duct diameter for maximum air velocity of 700 feet per minute. Branch ducts should be sized based on the CFM serving each branch.

INSTALLATION

The ventilation can be provided by either exhaust or supply of air into the home. When the fan providing ventilation is installed to push air into the house it is called the “supply-fan approach.” This approach is preferred because it directly controls the source of the ventilation air. If this supply-fan approach is used, the fan should not be placed in a bathroom, but in a more central location, preferably away from bedrooms. The fan should be located in the attic near the central forced air unit (e.g., furnace) is often convenient for accessibility; it should be ducted to the outside for supply of air to the fan. The supply fan should not be installed in bedrooms (due to possible noise concerns) or bathrooms (due to potential distribution of polluted air).

A simple and often less expensive alternative is to use an exhaust fan for ventilation. This approach should be used in the coldest areas of California because it is possible for the supply-fan approach to drive moist, warm air into walls, where it can condense, and is acceptable for all other areas of California. For the exhaust-fan approach, it is recommended that a special bathroom exhaust fan (properly sized and rated 1 sone or less) be used. This approach will depressurize the house; therefore, if there are any naturally-vented combustion appliances inside the house, care shall be taken such that the continuous-running fan does not effect combustion air requirements and cause unsatisfactory or potentially dangerous operation of such installed gas appliances.

To minimize obtrusive noise, a quiet fan should be selected (see Materials and Equipment). Flow resistance in all ducting shall be minimized. To get air flow to bedrooms and other spaces, all

doors to closeable rooms shall be undercut by ½" to ¾" above the carpet or threshold to allow for unobstructed airflow. Alternatively, transfer grilles may be installed.

Ducts shall be sized for maximum air velocities of 700 feet per minute (see Table 1 above or use formula: [minimum x-sectional area of duct in square feet] = [flow in cubic feet per minute]/ [700 feet per minute])

MATERIALS AND EQUIPMENT

All ventilation devices (exhaust fans, heat exchangers, operable windows, ducting, grilles, vents, etc.) shall meet all appropriate listing, certification, installation, and/or features required by applicable codes, including but not limited to UL, UBC, UMC, and Title 24. Fans should be rated for continuous duty and be noise rated at no more than 1 sone.